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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/803,750 | 03/18/2004 | Bryan C. Hendrix | ATMI-696 | 6889 |
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| ATMI, INC. 7 COMMERCE DRIVE DANBURY, CT 06810 | | | | |
| | | | EXAMINER STOUFFER, KELLY M | |
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1762

DATE MAILED: 11/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/803,750

Applicant(s)

HENDRIX ET AL.

Examiner

Kelly Stouffer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 11-14, 16-23, 27-31, 37-41, 43, 45-78, 80-93 and 97-112 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-8, 11-14, 16-23, 27-31, 37-41, 43, 45-78, 80-93 and 97-112 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 29 September 2006 with regard to the 35 USC 102 and 103 rejections involving Wade et al. have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 29 September 2006 with regard to the 35 USC 102 and 103 rejections involving Jin et al. have been fully considered but they are not persuasive. The Applicant argues that claims 65-84 and 88-96 are not anticipated by Jin et al. under 35 USC 102 (b). In column 4, lines 14-44 Jin et al. discloses repeating the ruthenium deposition process to create a layer with a final thickness of 100 Å or less. Applicant's arguments drawn to different processing conditions between layer depositions are not supported by the language in the claims, and are therefore not answered here. The examples of Jin et al. include the claimed process conditions as written. Therefore, the 102 (b) rejection of Jin et al. and similarly the 103 (a) rejection of Jin et al. in view of Aaltonen et al. are maintained and repeated here.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-8, 11-14, 16-23, 27-31, 37-41, 43 and 45-64 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification supports the provision of a ruthenium layer, specifically in example 2, but does not support the provision of a ruthenium metal layer with the claimed processing conditions that were added in the amendments filed 29 September 2006. The processing conditions as written in claim 1 are given in paragraph 0053 as under oxidizing conditions that someone of ordinary skill in the art would recognize as creating a ruthenium oxide layer and not a ruthenium metal layer. In addition, the specification does not support the provision in claim 1 of any co reactant gas, but only oxygen in paragraph 0055 and an oxygen/hydrogen combination in paragraph 0064. Similarly, claim 3 recites process conditions that are also in an oxidizing atmosphere in paragraph 0056.

Claims 2, 4-8, 11-14, 16-23, 27-31, 37-41, 43 and 45-64 are rejected as being dependent upon a rejected base claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 65-84 and 88-96 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Jin et al. (US 6,479,100 B2).

Jin teaches a method of forming a Ru film on a titanium nitride by depositing a Ru oxide seed layer followed by an annealing step that removes the oxygen content from the film and the process is repeated to deposit subsequent layers (column 4, lines 14-44). The examples anticipate all the process conditions claimed by the applicant, including precursors, solvents, co-reactants, temperatures, growth rates, resistance, delivery methods, and pressures.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-8, 11-14, 16-23, 27-31, 37-41, 43 and 45-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6440495 to Wade et al. in view of US Patent number 6743739 to Shimamoto et al.

Wade teaches a method of forming a Ru film on a titanium nitride by CVD (column 4, line 59 - column 5, line 13). A Ru oxide seed layer is deposited by CVD prior to the bulk layer (column 5, lines 14-37). The examples and tables anticipate all the process conditions claimed by the applicant, including precursors, solvents, co-reactants, temperatures, growth rates, resistance, delivery methods, and pressures. Wade et al. does not teach using a ruthenium metal layer as a seed layer. Shimamoto et al. teaches using a ruthenium metal seed layer in order to control the oxygen content in the resulting film (column 4 lines 3-14 and columns 5 and 6 lines 66-17).

It would have been obvious to one of ordinary skill in the art at the time of the

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invention to modify Wade et al. to include a ruthenium metal seed layer as taught by Shimamoto et al. in order to control the oxygen content in the resulting film.

5. Claims 17-19, 43-46, and 97-112 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wade et al. in view of Shimamoto et al. as applied above and in further view of Aaltonen et al. (US 2003/0165615 A1).

Wade et al. and Shimamoto et al. teach the limitations above, but do not explicitly teach $\text{Ru}(\text{thd})_3$ as a precursor. However, Aaltonen et al. teaches that the art recognized suitability of using $\text{Ru}(\text{thd})_3$ as the precursor. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use $\text{Ru}(\text{thd})_3$ as the precursor in Wade et al. and Shimamoto et al. By doing so, one would have a reasonable expectation of success, as Aaltonen et al. teaches the recognized suitability of doing such.

6. Claims 85-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. in view of Aaltonen et al. (US 2003/0165615 A1).

Jin teaches the limitations above, but does not explicitly teach $\text{Ru}(\text{thd})_3$ as a precursor. However, Aaltonen teaches that the art recognized suitability of using $\text{Ru}(\text{thd})_3$ as the precursor. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use $\text{Ru}(\text{thd})_3$ as the precursor in Jin. By doing so, one would have a reasonable expectation of success, as Aaltonen teaches the recognized suitability of doing such.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER